

ABSTRACT

**RECYCLABLE CATALYSTS METHODS
OF MAKING AND USING THE SAME**

Organometallic complexes are provided, which include a catalyst containing a transition metal, a ligand and a component having the formula GAr^{F} . Ar^{F} is an aromatic ring system selected from phenyl, naphthalenyl, anthracenyl, fluorenyl, or indenyl. The aromatic ring system has at least a substituent selected from fluorine, hydrogen, hydrocarbyl or fluorinated hydrocarbyl, G is substituted or unsubstituted $(\text{CH}_2)_n$ or $(\text{CF}_2)_n$, wherein n is from 1 to 30, wherein further one or more CH_2 or CF_2 groups are optionally replaced by NR, PR, SiR_2 , BR, O or S, or R is hydrocarbyl or substituted hydrocarbyl, GAr^{F} being covalently bonded to either said transition metal or said ligand of said catalyst, thereby rendering said cationic organometallic complex liquid. The catalyst of the organometallic complex can be $[\text{CpM}(\text{CO})_2(\text{NHC})\text{L}_k]^+\text{A}^-$, wherein M is an atom of molybdenum or tungsten, Cp is substituted or unsubstituted cyclopentadienyl radical represented by the formula $[\text{C}_5\text{Q}^1\text{Q}^2\text{Q}^3\text{Q}^4\text{Q}^5]$, wherein Q^1 to Q^5 are independently selected from the group consisting of H radical, GAr^{F} C_{1-20} hydrocarbyl radical, substituted hydrocarbyl radical, substituted hydrocarbyl radical substituted by GAr^{F} , halogen radical, halogen-substituted hydrocarbyl radical, -OR, -C(O)R', -CO₂R', -SiR'₃

and $-NR'R''$, wherein R' and R'' are independently selected from the group consisting of H radical, C_{1-20} hydrocarbyl radical, halogen radical, and halogen-substituted hydrocarbyl radical, wherein said Q^1 to Q^5 radicals are optionally linked to each other to form a stable bridging group, NHC is any N-heterocyclic carbene ligand, L is either any neutral electron donor ligand, wherein k is a number from 0 to 1 or L is an anionic ligand wherein k is 2, and A^- is an anion. Processes using the organometallic complexes as catalysts in catalytic reactions, such as for example, the hydrosilylation of aldehydes, ketones and esters are also provided.